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U. S. DEPARTMENT OF AGRICULTURE

ECONOMICAL DAIRY RATION *Saves Feed!*



U. S. DEPARTMENT OF AGRICULTURE
Office for Food and Feed Conservation
Information Supplied by
Agricultural Research Administration
Bureau of Dairy Industry



Grain conservation through more efficient feeding is vital to the Nation and to the individual dairy farmer. High-quality roughage is the basic essential for efficient feeding. The better the roughage, the more of it the cows will eat. The more roughage they eat, the less grain and other concentrates they will need. It is good business to make full use of the best roughage that you have, and to improve the quality of future supplies.

Tables in this folder will help dairy farmers make up suitable concentrate mixtures for use with roughages of different quality. The tables indicate feeds that furnish the most total digestible nutrients at least cost and at the same time supply necessary protein. Feeding such mixtures according to each cow's producing ability helps eliminate waste.

The amount of protein to include in the concentrate mixture will vary with the quality (protein content) of



the hay, silage, and other roughages in the ration. Table 1 shows the approximate amount of protein needed in the concentrate mixtures when fed with roughages of different quality, and the proportionate amounts of high-, medium-, or low-protein feeds to use in making up the concentrate mixture.

TABLE 1.—Concentrate mixtures to feed with different roughages

Quality of roughage fed	Protein content needed in concentrate mixture	To make up the concentrate mixture, use the following proportions of—		
		Low-protein feeds	Medium-protein feeds	High-protein feeds
	<i>Percent</i>	<i>Parts</i>	<i>Parts</i>	<i>Parts</i>
(A) First-quality legume hay or silage.....	12 to 13	6	3	1
(B) Average-quality legume hay or silage, or first-quality mixed hay or silage, or corn and sorghum silage.....	14 to 15	6	2	2
(C) Average-quality mixed hay and corn or sorghum silage.....	16 to 17	5	2	3
(D) Grass hay and corn silage.....	18 to 20	4	3	3

Table 2 (inside folder) lists the most common feeds in the low-, medium-, and high-protein groups. The number in parentheses after each feed refers to the column

in table 3 (inside folder) which gives the cost of 100 pounds of total digestible nutrients in that particular feed when the price of the feed ranges from \$25 to \$135 a ton.

Table 2.- List of common dairy feeds, with a code number after each

LOW-PROTEIN FEEDS

Alfalfa-molasses feed-----	(15)	Kafir grain-----	(3)
Barley-----	(4)	Milo head chops-----	(5)
Beet pulp, dried-----	(8)	Milo grain-----	(4)
Corn bran-----	(6)	Molasses, beet-----	(14)
Corn, well-dried-----	(2)	Molasses, cane-----	(15)
Corn, No. 2 grade-----	(3)	Oats-----	(8)
Corn-and-cob meal-----	(6)	Oat mill feed-----	(16)
Distillers' rye grains, dried--	(12)	Orange pulp, dried-----	(4)
Feterita grain-----	(4)	Potato flour-----	(5)
Feterita head chops-----	(9)	Potato pomace, dried-----	(9)
Grapefruit refuse, dried-----	(6)	Rye-----	(3)
Hegari grain-----	(3)	Sorghum grain-----	(6)
Hominy feed-----	(1)	Wheat-----	(2)
Rice bran-----	(10)		

Table 3.- Cost of 100 pounds of total digestible nutri

Cost of feed per ton	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
25-----	1.47	1.51	1.54	1.58	1.62	1.67	1.71	1.75
30-----	1.76	1.81	1.85	1.90	1.95	2.00	2.05	2.10
35-----	2.06	2.11	2.16	2.22	2.27	2.33	2.40	2.45
40-----	2.35	2.41	2.47	2.53	2.60	2.67	2.74	2.80
45-----	2.65	2.71	2.78	2.85	2.92	3.00	3.08	3.15
50-----	2.94	3.01	3.09	3.16	3.25	3.33	3.42	3.50
55-----	3.24	3.31	3.40	3.48	3.57	3.67	3.77	3.85
60-----	3.53	3.61	3.70	3.80	3.90	4.00	4.11	4.20
65-----	3.82	3.92	4.01	4.11	4.22	4.33	4.45	4.55
70-----	4.12	4.22	4.32	4.43	4.55	4.67	4.79	4.90
75-----	4.41	4.52	4.63	4.75	4.87	5.00	5.14	5.25
80-----	4.71	4.82	4.94	5.06	5.19	5.33	5.48	5.60
85-----	5.00	5.12	5.25	5.38	5.52	5.67	5.82	5.95
90-----	5.29	5.42	5.56	5.70	5.84	6.00	6.16	6.30
95-----	5.59	5.72	5.86	6.01	6.17	6.33	6.51	6.65
100-----	5.88	6.02	6.17	6.33	6.49	6.67	6.85	7.00
105-----	6.18	6.33	6.48	6.65	6.82	7.00	7.19	7.35
110-----	6.47	6.63	6.79	6.96	7.14	7.33	7.53	7.70
115-----	6.76	6.93	7.10	7.28	7.47	7.67	7.88	8.05
120-----	7.06	7.23	7.41	7.59	7.79	8.00	8.22	8.40
125-----	7.35	7.53	7.72	7.91	8.12	8.33	8.56	8.75
130-----	7.65	7.83	8.02	8.23	8.44	8.67	8.90	9.10
135-----	7.94	8.13	8.33	8.54	8.77	9.00	9.25	9.45

Table 2.- List of common dairy feeds, with a code number after each feed that refers to the column of the same code number in table 3

LOW-PROTEIN FEEDS				MEDIUM-PROTEIN FEEDS		HIGH-PROTEIN FEEDS	
Alfalfa-molasses feed-----	(15)	Kafir grain-----	(3)	Beans, field-----	(6)	Corn gluten meal-----	(3)
Barley-----	(4)	Milo head chops-----	(5)	Brewers' grains, dried-----	(11)	Cottonseed meal-----	(6)
Beet pulp, dried-----	(8)	Milo grain-----	(4)	Coconut oil meal, old process---	(3)	Fish meal-----	(10)
Corn bran-----	(6)	Molasses, beet-----	(14)	Corn gluten feed-----	(5)	Linseed meal, old process-----	(4)
Corn, well-dried-----	(2)	Molasses, cane-----	(15)	Distillers' corn grains, dried--	(1)	Linseed meal, solvent process----	(7)
Corn, No. 2 grade-----	(3)	Oats-----	(8)	Distillers' grains, mixed dried-	(6)	Peanut-oil-meal, old process-----	(2)
Corn-and-cob meal-----	(6)	Oat mill feed-----	(16)	Peas and pea feed-----	(4)	Peanut-oil-meal, solvent process--	(7)
Distillers' rye grains, dried--	(12)	Orange pulp, dried-----	(4)	Peanut skins-----	(9)	Peanuts, whole pressed-----	(15)
Feterita grain-----	(4)	Potato flour-----	(5)	Rye middlings-----	(5)	Skim milk, dried-----	(2)
Feterita head chops-----	(9)	Potato pomace, dried-----	(9)	Wheat bran-----	(8)	Soybeans-----	(1)
Grapefruit refuse, dried-----	(6)	Rye-----	(3)	Wheat middlings-----	(4)	Soybean-oil-meal, expeller process	(2)
Hegari grain-----	(3)	Sorghum grain-----	(6)	Yeast grains, dried-----	(13)	Soybean-oil-meal, solvent process-	(5)
Hominy feed-----	(1)	Wheat-----	(2)			Yeast, dried-----	(6)
Rice bran-----	(10)						

Table 3.- Cost of 100 pounds of total digestible nutrients in various feeds at different prices per ton of feed

Cost of feed per ton	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
25-----	1.47	1.51	1.54	1.58	1.62	1.67	1.71	1.76	1.81	1.87	1.92	1.98	2.05	2.12	2.19	2.91
30-----	1.76	1.81	1.85	1.90	1.95	2.00	2.05	2.11	2.17	2.24	2.31	2.38	2.46	2.54	2.63	3.49
35-----	2.06	2.11	2.16	2.22	2.27	2.33	2.40	2.46	2.54	2.61	2.69	2.78	2.87	2.97	3.07	4.07
40-----	2.35	2.41	2.47	2.53	2.60	2.67	2.74	2.82	2.90	2.99	3.08	3.17	3.28	3.39	3.51	4.65
45-----	2.65	2.71	2.78	2.85	2.92	3.00	3.08	3.17	3.26	3.36	3.46	3.57	3.69	3.81	3.95	5.23
50-----	2.94	3.01	3.09	3.16	3.25	3.33	3.42	3.52	3.62	3.73	3.85	3.97	4.10	4.24	4.39	5.81
55-----	3.24	3.31	3.40	3.48	3.57	3.67	3.77	3.87	3.99	4.10	4.23	4.37	4.51	4.66	4.82	6.40
60-----	3.53	3.61	3.70	3.80	3.90	4.00	4.11	4.23	4.35	4.48	4.62	4.76	4.92	5.08	5.26	6.98
65-----	3.82	3.92	4.01	4.11	4.22	4.33	4.45	4.58	4.71	4.85	5.00	5.16	5.33	5.51	5.70	7.56
70-----	4.12	4.22	4.32	4.43	4.55	4.67	4.79	4.93	5.07	5.22	5.38	5.56	5.74	5.93	6.14	8.14
75-----	4.41	4.52	4.63	4.75	4.87	5.00	5.14	5.28	5.43	5.60	5.77	5.95	6.15	6.36	6.58	8.72
80-----	4.71	4.82	4.94	5.06	5.19	5.33	5.48	5.63	5.80	5.97	6.15	6.35	6.56	6.78	7.02	9.30
85-----	5.00	5.12	5.25	5.38	5.52	5.67	5.82	5.99	6.16	6.34	6.54	6.75	6.97	7.20	7.46	9.88
90-----	5.29	5.42	5.56	5.70	5.84	6.00	6.16	6.34	6.52	6.72	6.92	7.14	7.38	7.63	7.89	10.47
95-----	5.59	5.72	5.86	6.01	6.17	6.33	6.51	6.69	6.88	7.09	7.31	7.54	7.79	8.05	8.33	11.05
100-----	5.88	6.02	6.17	6.33	6.49	6.67	6.85	7.04	7.25	7.46	7.69	7.94	8.20	8.47	8.77	11.63
105-----	6.18	6.33	6.48	6.65	6.82	7.00	7.19	7.39	7.61	7.84	8.08	8.33	8.61	8.90	9.21	12.21
110-----	6.47	6.63	6.79	6.96	7.14	7.33	7.53	7.75	7.97	8.21	8.46	8.73	9.02	9.32	9.65	12.79
115-----	6.76	6.93	7.10	7.28	7.47	7.67	7.88	8.10	8.33	8.58	8.85	9.13	9.43	9.75	10.09	13.37
120-----	7.06	7.23	7.41	7.59	7.79	8.00	8.22	8.45	8.70	8.96	9.23	9.52	9.84	10.17	10.53	13.95
125-----	7.35	7.53	7.72	7.91	8.12	8.33	8.56	8.80	9.06	9.33	9.62	9.92	10.25	10.59	10.96	14.53
130-----	7.65	7.83	8.02	8.23	8.44	8.67	8.90	9.15	9.42	9.70	10.00	10.32	10.66	11.02	11.40	15.12
135-----	7.94	8.13	8.33	8.54	8.77	9.00	9.25	9.51	9.78	10.07	10.38	10.71	11.07	11.44	11.84	15.70

HOW TO USE THE TABLES

Suppose your roughage consists of first-quality mixed clover and timothy hay, and also good corn silage. According to table 1, this would be "B" quality roughage and it would be necessary to feed a concentrate mixture containing from 14 to 15 percent of protein.

Now, suppose that you have the following feeds or that you can buy them on the market at the prices indicated:

Wheat bran at \$65; No. 2 corn at \$80; Oats at \$70; Molasses (cane) at \$55; Corn gluten feed at \$80; Linseed meal at \$90; Cottonseed meal at \$95; and Barley at \$75.

Referring to the list of feeds (table 2) you will find wheat bran in the "medium-protein group" and after it the number (8). Column 8 in table 3 gives \$4.58 as the cost of 100 pounds for total digestible nutrients in wheat bran at \$65 a ton. Following a similar procedure for each of the other feeds gives the following costs:

	Cost per 100 pounds T. D. N.
Low-protein feeds:	
Corn, No. 2 grade, at \$80 a ton.....	\$4.94
Barley, at \$75 a ton.....	4.75
Molasses, cane, at \$55 a ton.....	4.82
Oats, at \$70 a ton.....	4.93
Medium-protein feeds:	
Wheat bran, at \$65 a ton.....	4.58
Corn gluten feed, at \$80 a ton.....	5.19

High-protein feeds:

	Cost per 100 pounds T. D. N.
Linseed meal, old process, at \$90 a ton.....	\$5.70
Cottonseed meal, at \$95 a ton.....	6.33

Now, according to table 1, the concentrate mixture to be fed with "B" quality roughage should have 6 parts of low-protein feeds, 2 parts of medium-protein feeds, and 2 parts of high-protein feeds. Since barley is the cheapest of the 4 low-protein feeds, this part of the roughage would consist of 6 parts of barley. Since wheat bran is cheaper than corn gluten feed, the medium-protein feeds in the ration would preferably be 2 parts of wheat bran; and since linseed meal is the cheaper of the two high-protein feeds available, this part of the mixture would be 2 parts of linseed meal. The final mixture, therefore, would be 6 parts barley, 2 parts wheat bran, and 2 parts linseed meal (all parts by weight).

This will give a concentrate mixture of approximately 14-percent protein, which is suitable for feeding with roughage of the "B" quality.

FEED CONCENTRATE MIXTURES ACCORDING TO PRODUCTION

Each cow should get all the good-quality roughage she will eat, and in addition she should be fed enough of the concentrate mixture to provide all the additional nutrients needed to maintain her body weight and her milk and butterfat production. Table 4 provides the necessary figures for calculating the amount of concentrates to feed to cows of different weights and milk production.

TABLE 4.—A schedule for feeding concentrates according to production

Fat content of the milk (Percent)	Daily milk production that may be expected from cows of different weights when consuming all the good quality roughage they will eat				Concentrates to feed for each additional 5 pounds of milk Pounds
	700-lb. cow Pounds	1,000-lb. cow Pounds	1,200-lb. cow Pounds	1,400-lb. cow Pounds	
3.0.....	12	18	22	25	2.0
4.0.....	10	15	19	22	2.2
5.0.....	9	13	17	19	2.5
6.0.....	8	12	14	17	2.8

For example, assume that the cow weighs 1,400 pounds and is producing 50 pounds of 4-percent milk daily. According to table 4, such a cow may be expected to produce about 22 pounds of milk from the roughage alone. To provide for the extra 28 pounds of milk she is producing, she will need 2.2 pounds of concentrates for each 5 pounds of milk in excess of 22. That is, 28 divided by 5 gives 5.6. Multiplying 5.6 by 2.2 gives

12.4, or the pounds of concentrate mixture to feed this cow daily as long as she is producing 50 pounds of milk a day.

(This leaflet is based upon and contains essentially the same information as the leaflet "How To Make Up an Economical Dairy Ration," BDIM-Inf-57, published in November 1947 by the United States Department of Agriculture, Bureau of Dairy Industry.)